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day 32

$\frac{d}{dx}(e^{kx}) = ke^{kx}$

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Hw due tomorrow

3.6 / 11-12, 19, 27-30

3.7 / 10-12, 19-22, 35-36

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3.6/17

1995 $(t=0)$ → 2005 $(t=10)$

$p(t)=-0.27t^2+101t+7055$

a) avg growth: $\frac{p(10)-p(0)}{10-0}=$

$=\frac{-27+1010+7055-7055}{10}=98.3\ \frac{\text{thousand ppl}}{\text{yr}}$

b) what was the growth rate at $t=2$?

$p'(t)=-.54t+101$

$p'(2)=99.92$

$p'(10)=95.6$ thou ppl/yr

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course on quadratics

36/23

$f(t)=h_1(t)=-16t^2+32t+48$

$g(t)=h_2(t)=-16t^2+V_0t$

find V_0 so max height is same

max height of $f(t)$: when $v(t)=0$ [use calc]

$f'(t)=-32t+32 \Rightarrow t=1$

$f(1)=64$ ft

precalc way: find vertex [first find axis of symmetry]

$f(t)=-16t^2+32t$

$=-16t(t-2)$

x-int at $t=0, t=2$

axis of sym $=\frac{0+2}{2}$: $\cancel{t}=1$

want max height of $-16t^2+V_0t=64$

at $t=1$

$-16+V_0=64$

$V_0=80$ ft/sec

$g(t)=-16t^2+80t=-16t(t-5)$

max at $t=2.5$

$g(t)=-16t^2+V_0t$

$g'(t)=-32t+V_0$

$0=-32t+V_0$

$32t=V_0$

$t=\frac{V_0}{32} \Rightarrow g\left(\frac{V_0}{32}\right)=-16\left(\frac{V_0}{32}\right)^2+V_0\left(\frac{V_0}{32}\right)$

$g\left(\frac{V_0}{32}\right)=\frac{-16}{32\cdot 32}V_0^2+\frac{1}{32}V_0^2=V_0^2\left[\frac{-1}{64}+\frac{1}{32}\right]=\frac{1}{64}V_0^2$

$64=\frac{1}{64}V_0^2 \Rightarrow (64)^2=V_0^2$

So $V_0=64$ to make height 64 ft

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day 32

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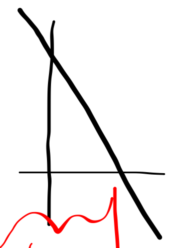
3.6/10) $f(t) = -t^2 + 4t - 3$; $t \in [0,5]$

a. $\cap$

b. $v(t) = f'(t) = -2t + 4$



c. $v(1) = -2(1) + 4 = 2$

$a(1) = -2$

particle moving right

d) $a(0) = -2$

because $a(t) = -2$

not move

move to left

e) speed increasing.

sign of $v(t)$: $+ + + + \mid - - - - - -$

sign of $a(t)$: $- - - - \overset{2}{\mid} - - - -$

speeding up on $(2, \infty)$

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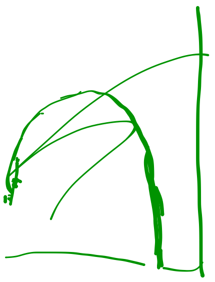
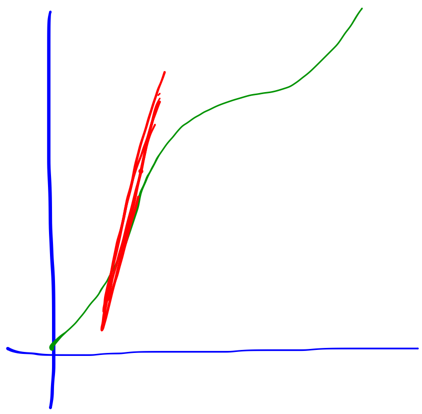
3.6/24)





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day 32

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3.7/6) $Q(x) = \cos^4(x^2+1) = [\cos(x^2+1)]^4$

$$x \xmapsto{h(x)} (x^2+1) \xmapsto{g(x)} \cos(x^2+1) \xrightarrow{f(x)} [\cos(x^2+1)]^4$$

$f(x) = x^4$ $f'(x) = 4x^3$

$g(x) = \cos(x)$ $g'(x) = -\sin(x)$

$h(x) = x^2+1$ $h'(x) = 2x$

$$\frac{d}{dx}[f(g(h(x)))] = f'(g(h(x))) \cdot \frac{d}{dx}(g(h(x)))$$
$$= f'(g(h(x))) \cdot g'(h(x)) \cdot h'(x)$$
$$= 4(\cos(x^2+1))^3 \cdot (-\sin(x^2+1)) \cdot (2x)$$